

University of Bahrain
College of Information technology
Department of Computer Engineering

Test (1)

Student Name	
I.D. No.	
Section	

Course Title: Digital Logic

Course number: ITCE 202

Semester: 1

Academic Year: 2008/2009

Duration : 1 hour 15 minutes

Date: 23rd November 2008

Read the following before you start:

1. Write your name, ID and section number
2. Answer all questions.
3. Write your answers on the attached sheets only.

Question	Mark	Mark attained
1	30	
2	15	
3	25	
4	30	
Total	100	

Question [1]: [30 mark]

(a) Convert the following numbers showing all steps.

[4 marks each]

$$(132)_{10} = (\quad)_2$$

$$(725.54)_8 = (\quad)_{16}$$

$$(0100)_2 = (\quad)_{\text{excess-3}}$$

$$(9)_{10} = (\quad)_{6-3-2-1}$$

$$(100010010100)_{\text{BCD}} = (\quad)_{10}$$

(b) Using 5-bit word length including sign fill in the following table.

[6 marks]

Number	1's complement	2's complement
+8		
- 8		
-16		



(c) Divide in binary 10001101 by 110

[4 marks]

Question [2] : [15 marks]

Simplify the Boolean expression using algebraic method (simplification and consensus theorems). Compare your answer using k-map.

$$f(A, B, C, D) = ABC' + (A'C' \oplus B)' + (C \oplus AD)$$



Question [3]:

[25 marks]

- a.** Implement the following Boolean function using a 4-to-1 multiplexer and any necessary gates.

$$f(X_2, X_1, X_0) = \Pi M(0, 5, 6, 7)$$

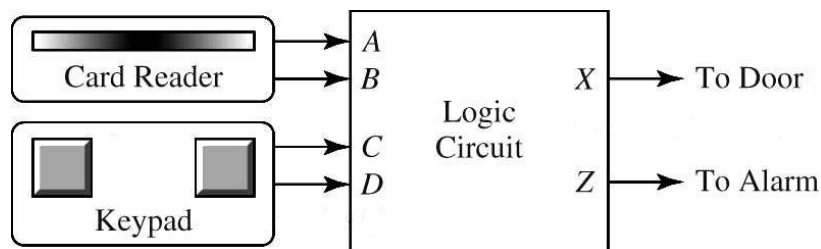
- b.** Implement the following function using 3-to-8 BIN/DEC decoder(s) and an AND gate.

$$f(A, B, C, D) = \sum m(0, 2, 4, 6, 8, 10, 13)$$



Question [5]: [30 mark]

A simple security system to open a door consists of a card reader and a keypad, as shown.



A person may open the door if he or she has a card containing the code and enters an authorized keypad code for that card. The outputs from the card reader are as follows:

A	B	
0	0	No card inserted
0	1	Valid code for door
1	0	Not used
1	1	Invalid card code

To unlock the door, a person must insert the card in the reader and hold the proper keys on the keypad. The authorized keypad code for the door is CD=10. If the card has an invalid code or if the wrong keypad code is entered, the alarm will ring when the card is inserted. If the correct keypad key is entered, the door will be unlocked when the card is inserted.

a. Construct the truth table of the security system.



- b.** Find the minterm expansion of Z in decimal notation.
- c.** Find the Maxterm expansion of X' in decimal notation.
- d.** Design the logic circuit for the simple security system using one decoder and two NAND gates.
- e.** Realize the minimum expression of Z in 3-level all NAND logic circuit.

